Short Course on Air Quality Forecasting

- Introduction, p. 5
- Air Quality and Meteorology, p. 19
- Obtaining and Interpreting Forecast Information, p. 61
- Developing Forecasting Tools, p. 84
- Forecast Verification, p. 121
- Daily Forecast Operations, p. 131

Course Objectives

Overall: Give you the necessary knowledge to develop, implement, and evaluate a basic forecasting program

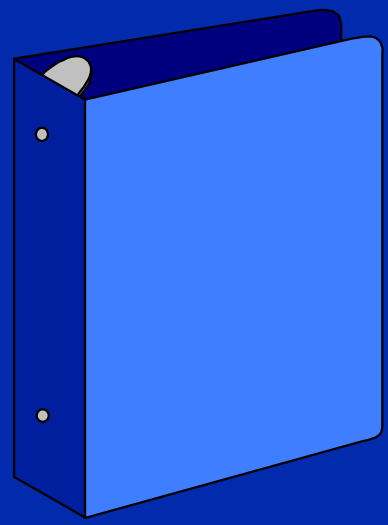
- Understand the meteorological processes that affect pollution concentrations.
- Learn how to use and evaluate meteorological forecast data.
- Discuss how to develop tools to forecast air quality.
- Present procedures for verifying forecasts.

Short Course: Design Goals

- **Focus.** Forecasting air quality. Primarily ozone, but approach also applies to other pollutants.
- **Practical.** Beyond theory, the course contains practical advice and reference to examples, tools, and methods.
- **Gateway.** The course workbook is a gateway to additional resources.
- **Evolving.** First time course, will improve in time through your feedback.

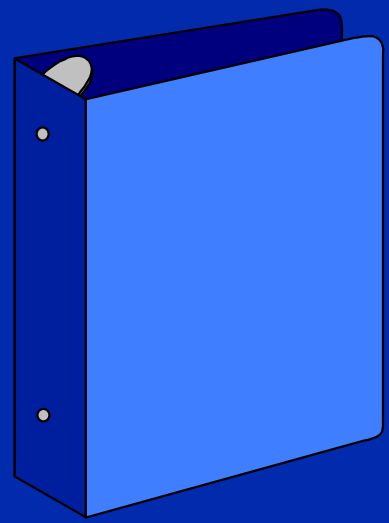
Outline of Course (Morning)

- Introduction (9:00-9:15)
  - Forecasting philosophy
  - Background air quality
- Air Quality and Meteorology (9:15-10:45)
  - Pollutant formation (ozone)
  - Diurnal ozone profiles
  - Air quality characterization
  - Basic meteorology
    - Surface
    - Aloft
    - Examples
- Break (10:45-11:00)
- Obtaining and Interpreting Forecast Information (11:00-12:00)
  - Resources
  - Examples of meteorological features



Outline of Course (Afternoon)

- Developing Forecasting Methods (1:00-2:00)
  - Evolution of forecasting programs
  - Climatology
  - Description of forecasting methods
- Verifying Forecasts (2:00-2:20)
  - When to verify
  - How to verify
- Daily Forecasting operations (2:20-2:45)
- Contest (2:45-3:00)
- Evaluation



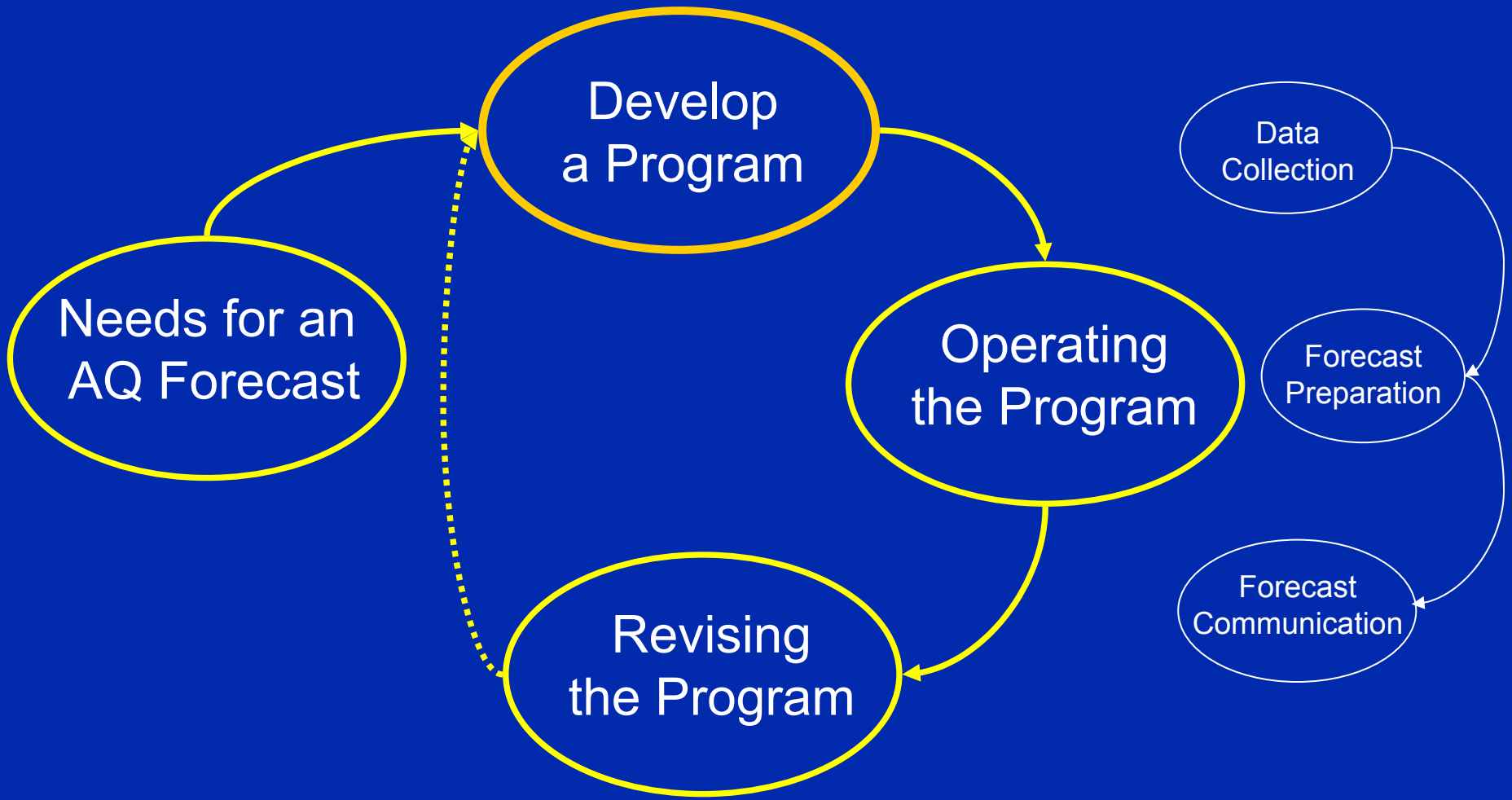
Why Forecast Air Quality?

- Protect public health
  - Allows public to plan activities to avoid exposure
  - Allows sensitive individuals to plan activities and healthcare

- Effectively run an emissions reduction program.
  - Participation depends on forecast accuracy and timeliness
  - Affects public's activities
  - Affects sponsor or donor agency support

- Conduct special sampling.
  - Allow sufficient time to prepare monitoring equipment and personnel.
  - Sample pre-episode conditions

Process of Developing a Forecasting Program



Forecasting Philosophy

- More forecasting tools = better results
  - "No silver bullet"
  - Based on the National Weather Service's method of weather forecasting
  - Several tools provide a consensus forecast
- Understanding how the system works:
  - Determine how meteorological processes influence air pollution in your area
  - Forecast the processes that affect air quality, then predict the air quality

Forecasting Philosophy

Predicting weather (and air quality) requires examining information for several different spatial and time scales.

Global

Space: 4,000 km – 20,000 km
Time : 1 - 2 weeks

Synoptic

Space: 400 km – 4,000 km
Time: 1 day – 1 week

Mesoscale

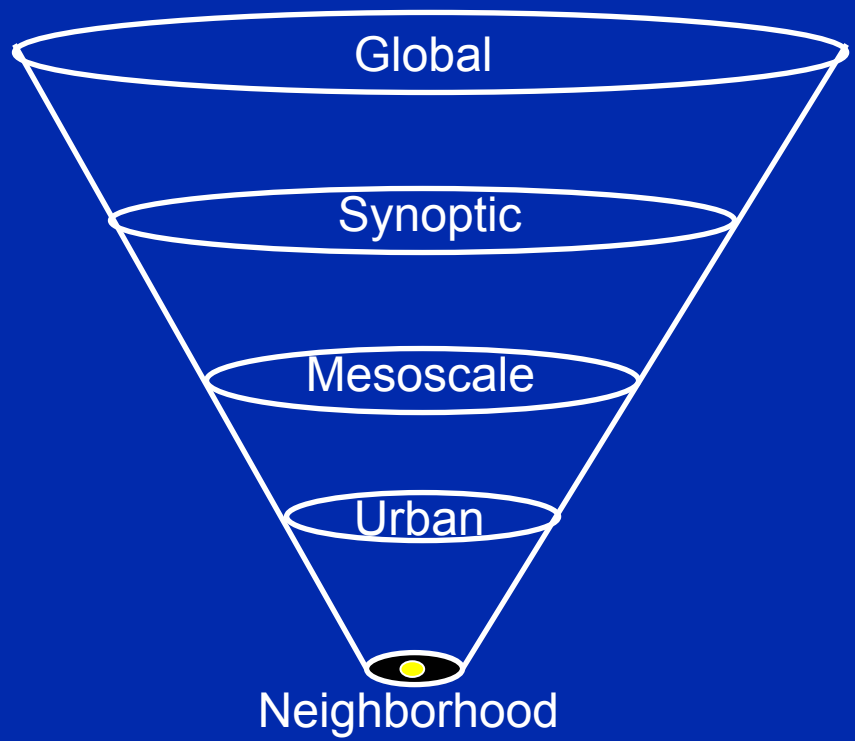
Space: 10 km – 400 km
Time: 1 hr – 1 day

Urban

Space: 5 km - 50 km
Time: 1 hr - 4 hr

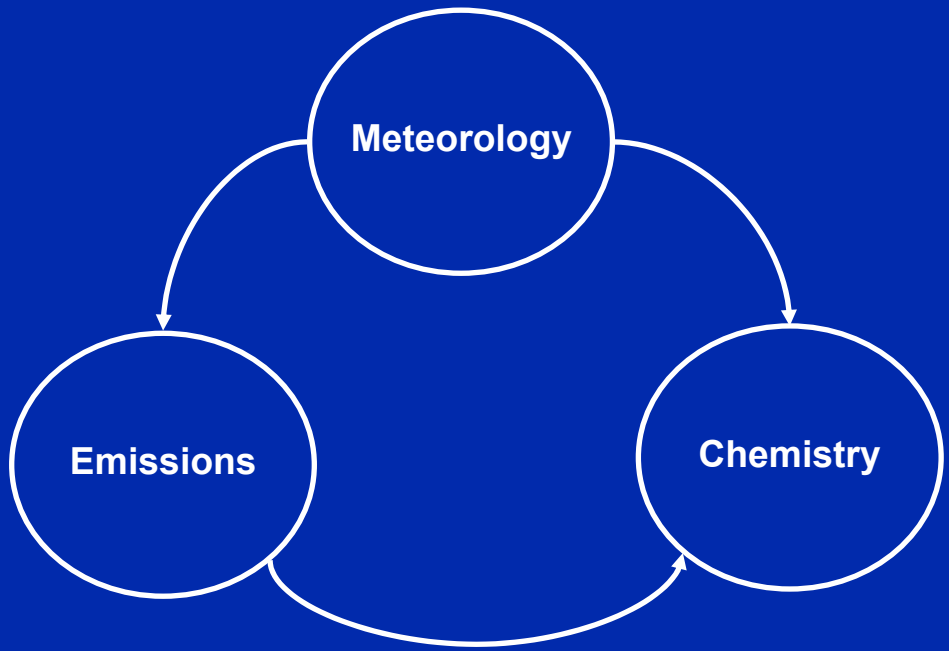
Neighborhood

Space: 500 m - 5 km
Time: 1 min – 1 hr

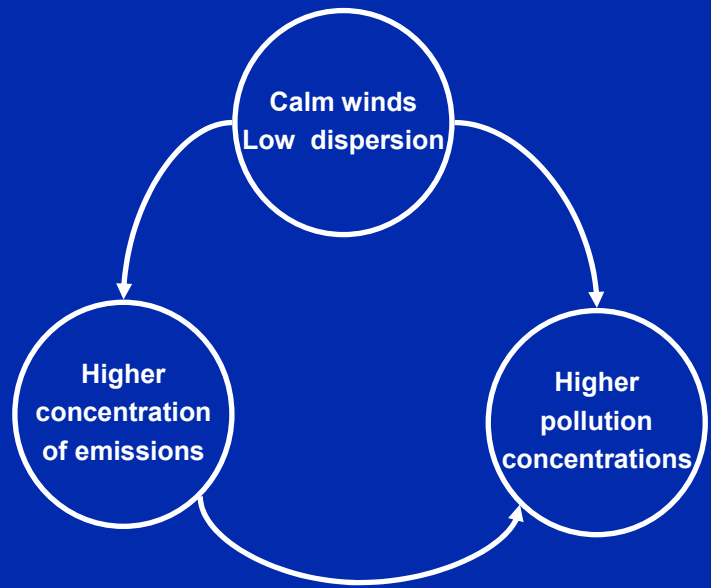


Forecasting Philosophy

- Predict weather's effect on
  - Emissions
  - Chemistry (ozone formation)
  - Pollutant transport and dispersion

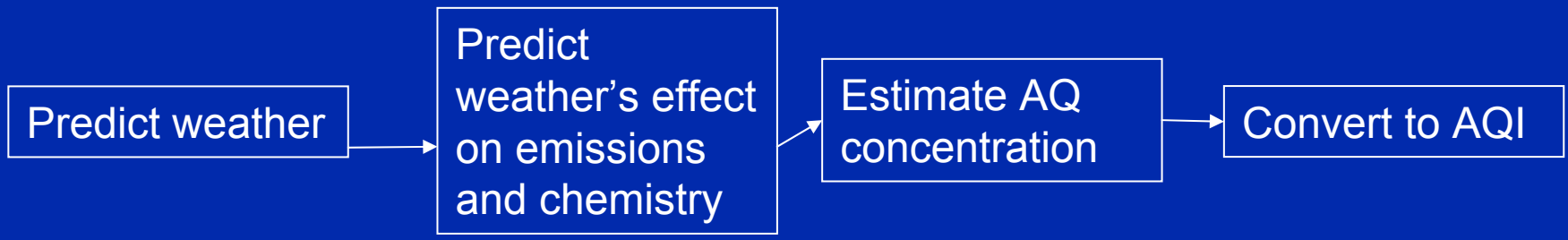


Example

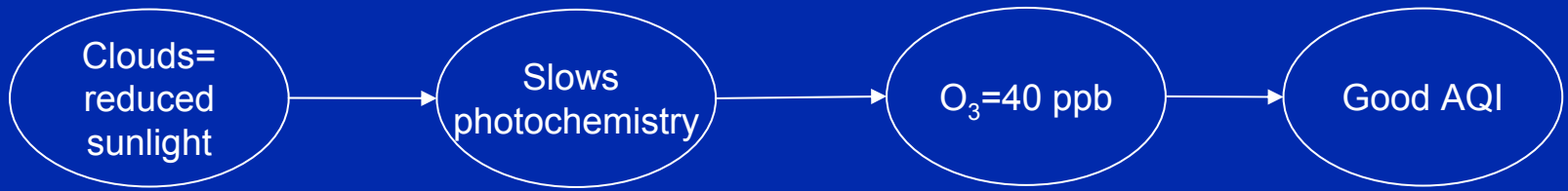


Forecasting Philosophy

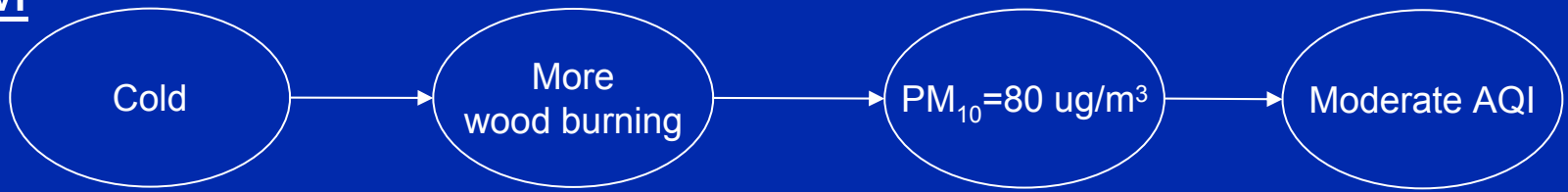
- Forecasting Process



Ozone

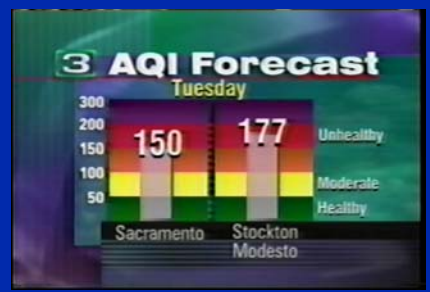


PM



What to forecast?

- Focus on AQI
- AQI composed of
  - **Ozone**
  - ***Particulate Matter (2.5)***
  - *Carbon Monoxide*
  - *Nitrogen Dioxide*
  - *Sulfur Dioxide*
- Forecast for
  - Hourly site values?
  - Maximum at each site?
  - Regional maximum?
  - Specific AQI value or AQI category?



Additional resources, see EPA forecasting guidance document

Summary

Forecasting air quality requires understanding the physical and chemical processes that influence pollutant concentrations.

- Next Steps
  - Overview of Air Quality (Chemistry and Emissions)
  - Meteorological Processes
- Questions

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